

REMARKS

Claims 1-22 stand rejected. Claims 1-4 and 8-14 stand rejected as being anticipated by U.S. Patent No. 5,583,468 by Kielmeyer et al. ("Kielmeyer"). Claims 5-7, 16, and 18 stand rejected as being unpatentable over Kielmeyer in view of JP 2003-86621 by Rohm ("Rohm"). Claims 12, 13, 15, and 19 stand rejected as being unpatentable over Kielmeyer in view of JP 55-118643 by Kenji ("Kenji"). Claims 20-22 stand rejected as being unpatentable over Kielmeyer in view of U.S. Patent No. 6,548,893 by Chen ("Chen"). Claims 1, 12, 16, 21, and 22 are canceled, rendering their rejections moot. Claims 5 and 17 are amended from dependent form to independent form, and claims 2, 9-11, 13-15, and 18-20 are amended to correct dependency. These amendments do not add new matter.

Rejections under 35 U.S.C. § 102

Claims 1-4 and 8-14 stand rejected as being anticipated by Kielmeyer. Claims 1 and 12 have been canceled, rendering their rejections moot. Claims 2 and 9-11 have been amended so that claims 2-4 and 8-11 depend from amended claim 5, which is discussed below. Claims 13 and 14 have been amended to depend from amended claim 17, which is also discussed below.

Rejections under 35 U.S.C. § 103

Claims 5-7, 16, and 18 stand rejected as being unpatentable over Kielmeyer in view of JP 2003-86621 by Rohm ("Rohm"). Claim 16 has been canceled, rendering its rejection moot. Claim 18 has been amended to depend from amended claim 17, which is discussed below. Amended claim 5 recites, among other elements, that "the first bond includes a ball bond and an intermediate bond, the intermediate bond being closer to the first edge than the ball bond." The Applicants teach that "using intermediate bonds, particularly on center conductors or other structures where ball bonds are difficult to place close to the edge of the center conductor, enables electrical interconnections with good impedance characteristics" (§ [0042]).

The Examiner acknowledges that Kielmeyer does not state that the first bond includes a ball bond and an intermediate bond, the intermediate bond being closer to the first edge than the ball bond. Referring to figures 1 and 4 of Kielmeyer, it is seen that no

intermediate bond is disclosed. The Examiner cites Rohm for disclosing an intermediate (stitch) bond, and urges that it would have been obvious to include an intermediate (stitch) bond as evidenced by Rohm to increase stability of the bond. The Examiner further acknowledges that the urged modification of Kielmeyer “does not specifically teach the intermediate bond being closer to the first edge than the ball bond, Rohm teaches locating the intermediate (stitch) bond in a location which optimizes the loop height of the wire bond ([0017]). Therefore, it would have been obvious to one having ordinary skill in the art . . . to form the intermediate bond closer to the first edge than the ball bond in the modified invention of Kielmeyer as taught by Rohm. The motivation for doing so would have been to optimize the lop (*sic*) height of the wire bond and thus increase the reliability of the device.” The Applicants respectfully traverse.

Each reference must be taken as a whole, including where the references diverge and teach away from the claimed invention (*In re Fritch*, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992)). In paragraph [0020], Rohm states it is better to have the second position P2 (*i.e.* the stitch bond) distant from semiconductor chip 2 in comparison with the first position P1. In paragraph [0028], Rohm states that it is desirable for the second position P2 to be on metallization part 4 that is distant from the semiconductor chip 2 in comparison with the first position P1. In reference to Fig. 2(d), Rohm describes the capillary 20 moving in the horizontal direction 20c away from the semiconductor chip 2 vis-à-vis the substrate. Rohm diverges from claim 5 because, taken as a whole, one of ordinary skill in the art would be led by Rohm to place the intermediate bond further away from the ball bond, and thus be led away from the modification of Kielmeyer urged by the Examiner.

The Examiner asserts that the motivation for the urged modification of Kielmeyer “to form the intermediate bond closer to the first edge than the ball bond in the modified invention of Kielmeyer as taught by Rohm . . . would have been to optimize the lop (*sic*) height of the wire bond and thus increase the reliability of the device”, citing paragraph [0017] of Rohm. However, in paragraph [0017], Rohm discloses the desirability of a low loop height (see Rohm, Fig. 2, ref. num. 8b). The modification urged by the Examiner would result in a configuration similar to that of the prior art shown in Fig. 5 of Rohm, in that a stitch bond being closer to the semiconductor chip 12 would likely form a loop height similar to loop 18a with a higher loop height 18b than the desirably lower loop

height 8b shown in Fig. 1. Therefore, the motivation for the modification urged by the Examiner is lacking because it appears to result in an inferior loop height.

No *prima facie* case of obviousness has been established. Claim 5 and all claims that depend from claim 5 are patentable.

Claim 6, which depends from claim 5 through claim 2, further recites that “the third bond includes a second ball bond and a second intermediate bond, the first ball bond being closer to an end of the first center conductor than the second ball bond.” The Applicants teach that “[b]all bonds 94, 96 are staggered along the length of the center conductor 90 to provide room for each ball bond” (¶ [0044] and Fig. 3C). The Applicants further teach that “[i]ntermediate bonds 98, 100, are placed closer to the edges of the center conductor than the ball bonds 94, 96, which improve impedance continuity of the electrical interconnection” (*Id.*). The references cited by the Examiner do not disclose or suggest claim 6.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). The burden is on the Examiner to set forth a *prima facie* case of obviousness. *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598-99 (Fed. Cir. 1988); *In re Piasecki*, 745 F.2d 1468, 223 USPQ 785 (Fed. Cir. 1984). “To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.” *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985)).

The Examiner has not indicated anywhere the prior art discloses or suggests “the first ball bond being closer to an end of the first center conductor than the second ball bond.” The Examiner asserts that one of ordinary skill would have been motivated to

optimize the loop height to increase the reliability of the device, but provides no convincing line of reasoning why one, after optimizing loop height for the first bond, would have placed the second ball bond a different distance from end of the first center conductor. It seems that if the ball bond placement were optimized for loop height, then one of ordinary skill would be led to place the second ball bond a similar distance from the end of the center conductor for similarly optimized loop height, and not place it nearer to or further from the end of the center conductor. The Examiner has not established a *prima facie* case of obviousness, and claim 6 is further patentable.

Claim 7, which depends from claim 5 through claims 6 and 2, further recites that "the first center conductor has a width less than or equal to twice a bond target width." The Applicants teach that "[t]he center conductors 90, 92 of planar microcircuits 87, 88 are too narrow to easily place side-by-side ball bonds because the width of the center conductor is less than twice the width . . . of a bond target area" (§[0044]). The Examiner asserts that Kielmeyer discloses a first center conductor having a width less than or equal to twice a bond target width, referencing figure 1.

During patent examination, the pending claims must be "given [their] broadest reasonable interpretation consistent with the specification." *In re Hyatt*, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000). The broadest reasonable interpretation of the claims must be consistent with the interpretation that those skilled in the art would reach. *In re Cortright*, 165 F.3d 1353, 1359, 49 USPQ2d 1464, 1468 (Fed. Cir. 1999) (emphasis added). The Applicants discuss bond target areas in paragraphs [0030] to [0032], and show a bond target area 40 in Fig. 2A. The undersigned respectfully directs the Examiner's attention to Kielmeyer, Fig. 4 ref. nums. 47, 48 and Fig. 5, ref. nums. 49, 50. One of ordinary skill in the art would interpret claim 7 to mean that the first center conductor has a width less than or equal to twice a bond target width in the portion where the bonds occur. Kielmeyer teaches away from claim 7 by disclosing a center-conductor bond pad 44 that is wider than the bonding areas 49, 50. Unfortunately, this creates a low-impedance section of center conductor that "most likely will not match a typical system impedance of 50 ohms" (Col. 6, lines 21-23). Kielmeyer includes a high-impedance section 46 of waveguide (*Id.*, line 25) to compensate for the low-impedance presented by bond pad 42. Kielmeyer does not disclose or suggest claim 7, and claim 7 is further

patentable. Amended claim 18, which depends from amended claim 17, is further patentable for at least similar reasons.

Claims 12, 13, 15, and 19 stand rejected as being unpatentable over Kielmeyer in view of JP 55-118643 by Kenji (hereinafter “Kenji”). Claim 17 has been amended to essentially include the language of claim 12, which has been canceled. Although claim 17 is indicated as being rejected in Office Action summary, it appears that the Examiner has omitted a detailed rejection of claim 17. The Examiner’s arguments regarding claim 12 are addressed below in support of amended claim 17.

Amended claim 17 recites, among other elements, “a first bond wire coupled to a first edge with a first ball bond and a first intermediate bond, and to the component with a first end bond”. “End bonds” are second tack or stitch bonds (Applicants’ Brief Summary of the Invention, ¶ [0010]). The Examiner states that “it is well known in the art to form each of the end bonds of a wire bond connection with a ball bond as evidenced by Kenji (figure 1).” This teaches away from claim 17 since the end bond recited in claim 17 is not a ball bond, as in Kenji, and the urged modification of Kielmeyer would not result in claim 17. Therefore, claim 17 and all claims that depend from claim 17 are allowable.

Claim 17 further recites that “the first intermediate bond is closer to the first edge than the first ball bond.” Kenji does not disclose or suggest a first intermediate bond closer to the first edge than the first ball bond. Even if Rohm were combined with Kielmeyer and Kenji, claim 17 would be allowable for at least the reasons given above in support of the patentability of claim 5.

Claims 20-22 stand rejected as being unpatentable over Kielmeyer in view of U.S. Patent No. 6,548,893 by Chen (“Chen”). Claims 21 and 22 have been canceled, rendering their rejections moot. However, the Applicants respectfully traverse the Examiner’s characterization of the disclosure of Chen, and traverse the Examiner’s asserted motivation. Claim 20 has been amended to depend from claim 17, and is patentable for at least the reasons given above in support of claim 17.

CONCLUSION

The Applicant submits that all claims are now in condition for allowance. Favorable reconsideration and timely issuance of a Notice of Allowance are respectfully requested. Should the Examiner consider necessary or desirable any formal changes

anywhere in the specification, claims, and/or drawings, then it is respectfully asked that such changes be made by an examiner's amendment, if the Examiner feels this would facilitate passage of the case to issuance. If the Examiner believes a telephone conference would expedite prosecution of this application, the Examiner is cordially invited to telephone the undersigned at (707) 591-0789.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read "Scott Hewett", with a long horizontal flourish extending to the right.

Scott Hewett
USPTO Reg. No. 41,836

Scott Hewett
Patent Attorney
400 West Third Street, No. 223
Santa Rosa, CA 95401
Tel.: (707) 591-0789
Fax.: (707) 591-0392